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# ***U.S. PATENT APPLICATION***

*Inventor(s):*      Masaru MITSUYOSHI  
                          Takayuki HAGA

*Invention:*      GAME APPARATUS, STORING MEDIUM STORING GAME PROGRAM,  
                          AND GAME METHOD

*NIXON & VANDERHYE P.C.  
ATTORNEYS AT LAW  
1100 NORTH GLEBE ROAD, 8<sup>TH</sup> FLOOR  
ARLINGTON, VIRGINIA 22201-4714  
(703) 816-4000  
Facsimile (703) 816-4100*

## ***SPECIFICATION***

## **TITLE OF THE INVENTION**

Game Apparatus, Storing Medium Storing Game Program, and Game Method

## **BACKGROUND OF THE INVENTION**

5      Field of the invention

The present invention relates to a game apparatus, a storing medium that stores a game program, and a game method. More specifically, the present invention relates to a game apparatus, a storing medium that stores a game program, and a game method that use an ultraviolet ray for a game.

10     Description of the prior art

When children play a television game, they have little time to play outdoors, and therefore, the children have few opportunities to be exposed to sunlight. Thus, an influence on a children's growth (their bones become weaker, thus easily broken, and so forth, for example) as a result of a home-use television game being played is viewed as a problem. To solve such the problem, it is proposed a portable terminal, in which the sunlight is collected, and reflected on a game.

15     One example of such a prior art is disclosed in Japanese Patent Laying-open No. 2001-255205 [G01J 1/42, A63F 13/00, G01J 1/02] laid-open on September, 21, 2001. This ultraviolet ray monitoring apparatus is an apparatus related to an art in which as a result of an intensity of the ultraviolet ray included in the sunlight being detected using a ultraviolet ray sensor, instantaneous or accumulative ultraviolet ray information is created, and a game content is changed (change in growth of a plant, for example) based on the created ultraviolet ray information. Furthermore, if continuously used for a long period of time, the ultraviolet ray monitoring apparatus is provided with a function for 20 issuing a warning that informs of being excessively exposed to the ultraviolet ray.

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However, although the sunlight is good for a health, if excessively exposed to the ultraviolet ray included in the sunlight, some children (players) may have an inflammation of a skin caused by sunburn. The ultraviolet ray greatly differs in the intensity depending on a season as shown in Figure 28, for example, and although in summer, the children are excessively exposed to the ultraviolet ray only for a few hours, in the seasons (periods) other than summer, no or effectively no adverse effect is caused due to the ultraviolet ray even if being outdoors for the same amount of time.

In addition, as in the ultraviolet ray monitoring apparatus in the prior art, in a case of reflecting the ultraviolet ray in the game content, if the detected ultraviolet ray value is directly used, a large difference is occurred depending on the season, and therefore, it is not possible to apply the same fascinating aspect of the game between in summer when the ultraviolet ray value is high and in winter when the ultraviolet ray value is low, for example. Thus, there occurs a problem that a game balance is collapsed. Furthermore, when continuously used for a long period of time, only the warning that informs of being excessively exposed to the ultraviolet ray is given. Therefore, it is probable that the player neglects the warning and continues the game, thus there is a problem that it is not possible to effectively prevent an excessive exposure to the ultraviolet ray.

## SUMMARY OF THE INVENTION

Therefore, it is a primary object of the present invention to provide a novel game apparatus, a storing medium that stores a game program, and a game method.

It is another object of the present invention to provide a game apparatus, a storing medium that stores a game program, and a game method capable of giving a constant fascinating aspect of a game without being affected by a variance depending on a location of use or a period in a case of using an ultraviolet ray for the game.

It is still another object of the present invention to provide a game apparatus, a storing medium that stores a game program, and a game method capable of effectively preventing an excessive exposure to ultraviolet ray.

A game apparatus according to the present invention is a game apparatus that uses an ultraviolet ray for a game, and comprises: a game program storing means; an operating means; an ultraviolet ray value detecting means; a correcting-data storing means; an ultraviolet ray value correcting means; and a game process means. The game program storing means stores a game program. The operating means inputs operating information by a player. The ultraviolet ray value detecting means detects an ultraviolet ray value. The correcting-data storing means stores correcting data for correcting the ultraviolet ray value. The ultraviolet ray value correcting means corrects the ultraviolet ray value detected by the ultraviolet ray value detecting means based on the correcting data. The game process means executes the game based on the game program stored in the game program storing means and the operating information input by the operating means, and uses for the game the ultraviolet ray value corrected by the ultraviolet ray value correcting means.

More specifically, the game apparatus (10: reference numeral. Hereinafter, the same) uses the ultraviolet ray for a game. The ultraviolet ray value detecting means (32a) detects an intensity of the ultraviolet ray, that is, the ultraviolet ray value, and the ultraviolet ray value correcting means (40, S9) uses the correcting data (606a, 606b) stored in the correcting-data storing means (60) so as to correct the detected ultraviolet ray value to the setting value of the ultraviolet ray value, for example. The game process means (40) executes the game based on the game program (602) stored in the game program storing means and the operating information of the player input by the operating means (16, 18, 20, 22, 24, 26, 28), and uses for the game the corrected ultraviolet ray

value.

According to the present invention, the ultraviolet ray value corrected using the correcting data is used for the game so that without being affected due to a variance of the ultraviolet ray value, it is possible to apply a constant fascinating aspect of the game.

5        In a certain aspect of the present invention, the correcting data includes a correcting value associated with a month/date, and a time, and comprises a first time-measuring means for measuring the month/date and the time. The ultraviolet ray value correcting means corrects the ultraviolet ray value detected by the ultraviolet ray value detecting means based on the correcting data corresponding to the month/date and  
10      the time measured by the first time-measuring means. More specifically, the correcting data (606) includes the correcting value associated with the month/date, and the time.  
The first time-measuring means (66) measures the month/date, and the time so that using the correcting value corresponding to the month/date and the time when the ultraviolet ray value is detected, it is possible to correct the ultraviolet ray value. That is, it is  
15      possible to easily correct the ultraviolet ray value based on the measured month/date and the time.

In another aspect of the present invention, the correcting-data storing means further stores two or more graph data having the ultraviolet ray value showing a change in time different depending on a period turned into a graph. The game apparatus further  
20      comprises a determining means for determining one graph data by comparing the ultraviolet ray value detected by the ultraviolet ray value detecting means with the ultraviolet ray value of the graph data. The ultraviolet ray value correcting means corrects the ultraviolet ray value detected by the ultraviolet ray value detecting means based on the correcting data corresponding to the graph data determined by the  
25      determining means. More specifically, the correcting data storing means (606) stores the

two or more graph data having the ultraviolet ray value showing a change in time  
different depending on the period turned into a graph so that by comparing the detected  
ultraviolet ray value with the graph data, it is possible to determine one graph data (606a).  
Therefore, it is possible to use the correcting data (606b) corresponding to the one graph  
5 data (606a). That is, without needing a clock function, it is possible to exactly correct the  
ultraviolet ray value. In addition, without being affected by a deviance of the clock as a  
result of the clock function being used, a time difference as a result of a difference of a  
region (longitude), a change of the ultraviolet ray value as a result of a difference of a  
region (latitude), a change of the ultraviolet ray value by each year, and etc., it is possible  
10 to make an exact correction.

In a certain embodiment of the present invention, a game apparatus further  
comprises a difference detecting means for detecting a difference between the ultraviolet  
ray value detected by the ultraviolet ray value detecting means and the ultraviolet ray  
value of the graph data. The determining means determines the graph data of a case that  
15 the difference detected by the difference detecting means is rendered the minimum. More  
specifically, the difference detecting means (40, S63, S103) detects the difference  
between the ultraviolet ray value detected by the ultraviolet ray value detecting means  
(32a) and the ultraviolet ray value of the graph data (606a). The determining means (40,  
S65, S117) determines the graph data (606a) of a case that the difference is rendered the  
20 minimum. That is, the graph data (606a) showing the most approximate change in time is  
determined, and the correcting data (606b) corresponding thereto is used so that it is  
possible to appropriately correct the detected ultraviolet ray value.

In another embodiment of the present invention, a game apparatus further  
comprises an ultraviolet ray value recording means for recording the ultraviolet ray value  
detected by the ultraviolet ray value detecting means according to a relative time-period,  
25

and a setting means for setting to an absolute time at which the highest ultraviolet ray value is detected out of the ultraviolet ray values of the graph data a relative time at which the highest ultraviolet ray value is detected out of the ultraviolet ray values detected by the ultraviolet ray value detecting means. The difference detecting means detects a  
5 difference at a time that the relative time is set to the absolute time by the setting means. More specifically, the ultraviolet ray value storing means (40, S149) stores the ultraviolet ray value detected by the ultraviolet ray value detecting means (32a) according to the relative time-period. The setting means (40, S95) sets to the absolute time-period (actual time-period) regarding the maximum ultraviolet ray value out of the ultraviolet ray values  
10 of the graph data (606a) the relative time-period regarding the maximum ultraviolet ray value out of the detected ultraviolet ray values. That is, a deviance of a time-period axis is temporarily corrected. Thus, the difference of the ultraviolet ray value in a state that the deviance is corrected is detected. Although it is possible to consider that the deviance of the time-period axis is corrected by each predetermined amount, and each difference is  
15 detected, it is possible to reduce a detecting (calculating) process of the difference, and etc., by moving the time-period axis to a vicinity expected to have the difference becoming the minimum.

In another embodiment of the present invention, the setting means includes an adjusting means for adjusting in such a manner that all the ultraviolet ray values detected  
20 by the ultraviolet ray value detecting means are contained between a sunrise and a sunset in the graph data. More specifically, the adjusting means (40, S97) adjusts in such a manner that the detected ultraviolet ray value is contained between the sunrise and the sunset so that not only the difference is rendered the minimum, but it is also possible to determine the graph data (606a) showing the same change in time. Thereby, it is possible  
25 to appropriately correct the detected ultraviolet ray value.

In another embodiment of the present invention, a game apparatus further comprises a second time-measuring means for measuring a time. The determining means compares the ultraviolet ray value detected by the ultraviolet ray value detecting means with the ultraviolet ray value of the graph data corresponding to the time measured by the second time-measuring means so as to determine the one graph data. More specifically, the second time measuring-means (66) measures the time. The determining means (40, S65) compares with the ultraviolet ray value of the graph data regarding the measured time so as to specify the one graph data. Even if the month/date is not known, it is possible to specify the graph data only based on the time.

10 In another aspect of the present invention, a game apparatus further comprises a third time-measuring means for measuring a detected time-period of the ultraviolet ray value by the ultraviolet ray value detecting means, an accumulated-value calculating means for calculating an accumulated value of the ultraviolet ray based on the ultraviolet ray value detected by the ultraviolet ray value detecting means and the detected time-period measured by the third time-measuring means, an accumulated-value determining means for determining whether or not the accumulated value calculated by the accumulated-value calculating means is equal to or larger than a predetermined value, and a game-process prohibiting means for prohibiting a game process when determined by the accumulated-value determining means that the accumulated value is equal to or larger than the predetermined value. More specifically, the third time-measuring means (66) measures a detected time-period of the ultraviolet ray value, and an accumulated-value calculating means (40, S41) calculates an accumulated value of the ultraviolet ray based on the ultraviolet ray value and the detected time-period. The accumulated-value determining means (40, S165, S185) determines whether or not the accumulated value is equal to or larger than a predetermined value (dangerous level, for

example). The game-process prohibiting means (40, S169, S189) prohibits a game process when the accumulated value is equal to or larger than the dangerous level. In addition to performing a warning display, the game process is prohibited so that it is possible to effectively prevent an excessive exposure to the ultraviolet ray.

5       In another aspect of the present invention, a game apparatus further comprises a sound controlling means for changing a sound in correspondence with the ultraviolet ray value detected by the ultraviolet ray value detecting means, and a sound outputting means for outputting the sound changed by the sound controlling means. More specifically, the sound controlling means (40, S47) changes the sound in correspondence with the detected 10 ultraviolet ray value, and the sound outputting means (34, 40, S47) outputs the changed sound. A player can easily know by the sound that the ultraviolet ray is being detected, and besides, the player can also know an intensity of the ultraviolet ray, and etc., by a change of the sound, for example.

15      In a certain embodiment of the present invention, the sound controlling means changes at least one of a kind, a stress, a pitch, a tempo, and a melody of the sound. More specifically, the sound controlling means (40, S47) changes at least one of the kind, the stress, the pitch, the tempo, and the melody of the sound so that besides informing of detecting the ultraviolet ray, and so forth, it is possible to improve taste of the game.

20      Another game apparatus according to the present invention, and comprises a game program storing means, an operating means, an ultraviolet ray value detecting means, a game process means, a first time-measuring means, an accumulated-value calculating means, an accumulated-value determining means, and a game-process prohibiting means. The game program storing means stores the game program. The operating means inputs the operating information by a player. The ultraviolet ray value detecting means detects 25 an ultraviolet ray value. The game process means executes a game based on the game

program stored in the game program storing means and the operating information input by the operating means, and uses for the game the ultraviolet ray value detected by the ultraviolet ray value detecting means. The first time-measuring means measures a detected time-period of the ultraviolet ray value by the ultraviolet ray value detecting means. The accumulated-value calculating means calculates an accumulated value of the ultraviolet ray based on the ultraviolet ray value detected by the ultraviolet ray value detecting means and the detected time-period measured by the first time-measuring means. The accumulated-value determining means determines whether or not the accumulated value calculated by the accumulated-value calculating means is equal to or larger than a predetermined value. The game-process prohibiting means prohibits a game process by the game process means when determined by the accumulated-value determining means that the accumulated value is equal to or larger than the predetermined value.

More specifically, in the game apparatus (10), the game process means (40) executes a game based on the game program (602) stored in the game program storing means (60) and the operating information input by the operating means (16, 18, 20, 22, 24, 26, 28), and uses for the game the ultraviolet ray value detected by the ultraviolet ray value detecting means. The first time-measuring means (66) measures a detected time-period of the ultraviolet ray value, and the accumulated-value calculating means (40, S41) calculates an accumulated value of the ultraviolet ray based on the detected ultraviolet ray value and the measured detected time-period. The accumulated-value determining means determines whether or not the accumulated value is equal to or larger than a predetermined value (dangerous level), and the game-process prohibiting means (40, S169, S189) prohibits a game process by the game process means (40) when the accumulated value is equal to or larger than the dangerous level. The game play is

forcedly prohibited so that it is possible to effectively prevent an excessive exposure to the ultraviolet ray as a result of the player playing the game that uses the ultraviolet ray value.

In a certain aspect of the present invention, a game apparatus further comprises a 5 warning means for issuing a warning that the game that uses the ultraviolet ray cannot be played when determined by the accumulated-value determining means that the accumulated value is equal to or larger than the predetermined value. More specifically, when the accumulated value is equal to or more than the dangerous level, the warning means (14, 40, S171) warns of not being possible to play the game that uses the ultraviolet 10 ray so that the player can easily know an excessive exposure to the ultraviolet ray, and besides, the player can know that the game that uses the ultraviolet ray cannot be played. That is, it is possible to effectively prevent the excessive exposure to ultraviolet ray.

In a certain embodiment of the present invention, the game-process prohibiting means prohibits the ultraviolet ray value detected by the ultraviolet ray value detecting 15 means from being used for the game. More specifically, the game-process prohibiting means (40, S169) prohibits the ultraviolet ray value from being used for the game, for example. Thus, it is prohibited to play the game that uses the ultraviolet ray, and however, it is possible for the player to select a game other than the game that uses the ultraviolet ray.

20 In another aspect of the present invention, the game-process prohibiting means forcedly ends the game process by the game process means, and the game apparatus further comprises a back-up means for backing-up game data immediately before the game process is forcedly ended by the game-process prohibiting means. More specifically, the game-process prohibiting means (40, S189) forcedly ends the game 25 process, for example. The back-up means (40, S167, S187) backs-up the game data

immediately before the game process is forcedly ended so that it is possible to surely save the game data that has been updated until this time. Therefore, the player is capable of resuming the game from a state immediately before being forcedly ended.

In another aspect of the present invention, a game apparatus further comprises a  
5 second time-measuring means for measuring an elapsed time-period from a time that the game process is prohibited by the game-process prohibiting means, an elapsed time-period determining means for determining whether or not the elapsed time-period measured by the second time-measuring means exceeds a predetermined time period, and a game-process-prohibition canceling means for canceling a game process prohibition  
10 when the elapsed time-period exceeds the predetermined time period. When the elapsed time-period does not exceed the predetermined time period, the game-process prohibiting means continues the game process prohibition. More specifically, the second time-measuring means (66) measures the elapsed time-period from a time that the game process is prohibited, and the elapsed time-period determining means (40, S173, S193)  
15 determines whether or not the elapsed time-period elapses the predetermined time period. The game-process-prohibition canceling means (40, S175, S195) cancels the game process prohibition when the elapsed time-period exceeds the predetermined time period. On the other hand, when the elapsed time-period does not exceed the predetermined time period, the game-process prohibiting means (40, S167, S189) continues the game process  
20 prohibition. That is, if the predetermined time period is elapsed, the player can play the game that uses the ultraviolet ray once again. However, until the predetermined time period is elapsed, a state that playing the game is prohibited remains.

In another embodiment of the present invention, a game apparatus further comprises a game data storing means including at least a first back-up area and a second  
25 back-up area, and a selecting means for selecting one of the game data stored in the first

back-up area and the game data stored in the second back-up area when starting the game.

The back-up means writes into the first back-up area the game data at a certain time when responding to an instruction of a player, and writes into the second back-up area the game data at a certain time when immediately before the game process is prohibited by the

5 game-process prohibiting means. More specifically, the game data storing means (62)

includes at least the first back-up area (622a) and the second back-up area (622b). The

back-up means (40, S17, S167, S189) writes into the first back-up area the game data at a certain time when responding to an instruction of a player, and on the other hand, writes into the second back-up area the game data at a certain time when immediately before the

10 game process is prohibited by the game-process prohibiting means (40, S169, S189).

That is, the game data is selectively written into the back-up area. Therefore, the selecting means (40, S27) is capable of selecting one of the game data stored in the first

back-up area (622a) and the game data stored in the second back-up area (622b) when

starting the game. That is, in a case of resuming the game from a portion that the player

15 last played, it is possible to read out the game data saved on a player's own will or the

game data immediately before the game process is prohibited.

In another aspect of the present invention, a game apparatus further comprises a sound controlling means for changing a sound in correspondence with the ultraviolet ray value detected by the ultraviolet ray value detecting means, and a sound outputting means

20 for outputting the sound changed by the sound controlling means. More specifically, the

sound controlling means (40, S47) changes the sound in correspondence with the detected

ultraviolet ray value, and the sound outputting means (34, 40, S47) outputs the changed

sound. The player is capable of easily knowing that the ultraviolet ray is being detected

by the sound, and besides, knowing an intensity of the ultraviolet ray, and etc., by the

25 change of the sound, for example.

In a certain embodiment of the present invention, the sound controlling means changes at least one of a kind, a stress, a pitch, a tempo, a melody of the sound. More specifically, the sound controlling means (40, S47) changes at least one of the kind, the stress, the pitch, the tempo, the melody of the sound so that besides informing that the ultraviolet ray is detected, and so forth, it is possible to increase taste of the game.

A storing means that stores a game program according to the present invention, and the storing means stores a game program of a game apparatus that is provided with an operating means for inputting operating information by a player, facilitates a game by generating and displaying a game image on a displaying means corresponding to the operating information, and uses an ultraviolet ray for the game. The game apparatus is further provided with a correcting-data storing means for storing correcting data for correcting an ultraviolet ray value, and the game program allows a processor of the game apparatus to execute following steps of: an ultraviolet ray value detecting step for detecting the ultraviolet ray value; an ultraviolet ray value correcting step for correcting the ultraviolet ray value detected by the ultraviolet ray value detecting step based on the correcting data; and a game process step for using the ultraviolet ray value corrected by the ultraviolet ray value correcting step for the game.

In this storing means that stores the game program, too, similar to the above-described game apparatus, it is possible to apply a constant fascinating aspect of the game.

The present invention is another storing means that stores a game program according to the present invention, and the storing means stores a game program of a game apparatus that is provided with an operating means for inputting operating information by a player, facilitates a game by generating and displaying a game image on a displaying means corresponding to the operating information, and uses an ultraviolet

ray for the game. The game program allows a processor of the game apparatus to execute following steps of: an ultraviolet ray value detecting step for detecting the ultraviolet ray value; a game process step for using for the game the ultraviolet ray value detected by the ultraviolet ray value detecting step; a time-measuring step for measuring a detected 5 time-period of the ultraviolet ray value by the ultraviolet ray value detecting step; an accumulated value calculating step for calculating an accumulated value of the ultraviolet ray based on the ultraviolet ray value detected by the ultraviolet ray value detecting step and the detected time-period measured by the time-measuring step; an accumulated-value determining step for determining whether or not the accumulated value calculated by the 10 accumulated value calculating step is equal to or larger than a predetermined value; and a game-process prohibiting step for prohibiting a game process when determined by the accumulated-value determining step that the accumulated value is equal to or larger than the predetermined value.

In another storing medium that stores this game program, too, similar to the 15 above-described invention of another game apparatus, it is possible to effectively prevent an excessive exposure to ultraviolet ray.

In a game method according to the present invention, a game apparatus is provided with a game program storing means for storing a game program and an operating means for inputting operating information by a player. The game method of the game apparatus 20 that uses an ultraviolet ray for a game, and the game apparatus is further provided with a correcting-data storing means that stores correcting data for correcting an ultraviolet ray value. The game method includes following steps of: (a) detecting the ultraviolet ray value, (b) correcting the ultraviolet ray value detected by the step (a) based on the correcting data, and (c) executing the game based on the game program stored in the 25 game program storing means and the operating information input by the operating means,

and using for the game the ultraviolet ray value corrected by the step (b).

In this game method, too, similar to the above-described game apparatus, it is possible to apply a constant fascinating aspect of the game.

In another game method according to the present invention, a game apparatus is provided with a game program storing means that stores a game program and an operating means for inputting operating information by a player, and uses an ultraviolet ray for a game. The game method comprises following steps of: (a) detecting the ultraviolet ray value, (b) executing the game based on the game program stored in the game program storing means and the operating information input by the operating means, and using for the game the ultraviolet ray value detected by the step (a), (c) measuring a detected time-period of the ultraviolet ray value by the step (c), (d) calculating an accumulated value of the ultraviolet ray based on the ultraviolet ray value detected in the step (a) and the detected time-period measured in the step (c), (e) determining whether or not the accumulated value calculated by the step (d) is equal to or larger than a predetermined value, and (f) prohibiting a game process by the step (b) when determined in the step (e) that the accumulated value is equal to or larger than the predetermined value.

In the invention of another game method, too, similar to the above-described invention of another game apparatus, it is possible to effectively prevent an excessive exposure to ultraviolet ray.

The above described objects and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

Figure 1 is an illustrative view showing one example of a game apparatus of the present invention;

Figure 2 is a block diagram showing electric structure of a video game apparatus shown in the Figure 1 embodiment;

5       Figure 3 is an illustrative view showing a memory map of a main memory shown in Figure 2;

Figure 4 is a graph of an ultraviolet ray value based on ultraviolet ray graph data shown in Figure 3;

10      Figure 5 (A) is a graph of an ultraviolet ray value in July and a setting value graph of an ultraviolet ray value in a game taking advantage of the ultraviolet ray value;

Figure 5 (B) is an illustrative view showing a table of corrected ratio data of the ultraviolet ray value in a case of Figure 5 (A);

Figure 6 is an illustrative view showing a memory map of a RAM shown in Figure 2;

15      Figure 7 is a flowchart showing a game process of a CPU shown in Figure 2;

Figure 8 is a flowchart showing a game starting process of the CPU shown in Figure 2;

Figure 9 is a flowchart showing an ultraviolet ray value informing process of the CPU shown in Figure 2;

20      Figure 10 (A) is a graph showing one example of a change in time of a detected ultraviolet ray value;

Figure 10 (B) is a graph shown by superimposing the graph shown in Figure 10 (A) and the graph based on the ultraviolet ray graph data;

25      Figure 11 is a flowchart showing one example of an ultraviolet ray value correcting process of the CPU shown in Figure 2;

Figure 12 (A) is a graph showing one example of a change in time of the detected ultraviolet ray value;

Figure 12 (B) is a graph based on ultraviolet ray graph data detected in advance;

Figure 12 (C) a graph shown by superimposing the graph in Figure 12 (A) and the graph in Figure 12 (B);

5 Figure 13 is a flowchart showing another example of the ultraviolet ray value correcting process of the CPU shown in Figure 2;

Figure 14 is an illustrative view showing one example of a relative time-period table;

10 Figure 15 is an illustrative view showing one example of a maximum value table;

Figure 16 (A) is an illustrative view showing another example of the maximum value table;

Figure 16 (B) is an illustrative view showing the other example of the maximum value table;

15 Figure 17 (A) is a graph of the ultraviolet ray value based on the maximum value table;

Figure 17 (B) is a graph of the ultraviolet ray value based on the ultraviolet ray graph data shown in Figure 3;

20 Figure 18 (A) is a graph shown by superimposing the graph A and the graph B in a case of setting a relative time-period A o'clock to actual time-periods 0 – 2 o'clock;

Figure 18 (B) is a graph shown by superimposing the graph A and the graph B in a case of setting the relative time-period A o'clock to actual time-periods 8 – 10 o'clock;

Figure 19 (A) is a graph shown by superimposing the graph A and the graph B in a case of setting the relative time-period A o'clock to actual time-periods 12 – 14 o'clock;

25 Figure 19 (B) is a graph shown by superimposing the graph A and the graph B in a

case of setting the relative time-period A o'clock to actual time-periods 14 – 16 o'clock;

Figure 20 (A) is a graph shown by superimposing the graph A and the graph B in a case of setting the relative time-period A o'clock to actual time-periods 16 – 18 o'clock;

Figure 20 (B) is a graph shown by superimposing the graph A and the graph B in a case of setting the relative time-period A o'clock to actual time-periods 22 – 24 o'clock;

Figure 21 (A) is a graph shown by superimposing the graph A in a case of setting the relative time-period A o'clock to actual time-periods 14 – 16 o'clock, and a graph based on the ultraviolet ray graph data in a period that the ultraviolet ray value is weak;

Figure 21 (B) is a graph shown by superimposing the graph A in a case of setting the relative time-period A o'clock to actual time-periods 14 – 16 o'clock, and a graph based on the ultraviolet ray graph data in a period that the ultraviolet ray value is relatively strong;

Figure 21 (C) is a graph shown by superimposing the graph A in a case of setting the relative time-period A o'clock to actual time-periods 14 – 16 o'clock, and a graph based on the ultraviolet ray graph data in a period that the ultraviolet ray value is strong;

Figure 22 is a flowchart showing of one portion of the other example of the ultraviolet ray value correcting process of the CPU shown in Figure 2;

Figure 23 is a flowchart showing of another portion of the other example of the ultraviolet ray value correcting process of the CPU shown in Figure 2;

Figure 24 is a flowchart showing of the other portion of the other example of the ultraviolet ray value correcting process of the CPU shown in Figure 2;

Figure 25 is a flowchart showing a maximum value table updating process of the CPU shown in Figure 2;

Figure 26 is a flowchart showing one example of a usage limiting process of the CPU shown in Figure 2;

Figure 27 is a flowchart showing another example of the usage limiting process of the CPU shown in Figure 2; and

Figure 28 is a graph showing a change in ultraviolet ray value by each season in an area in which four seasons exist such as Japan.

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## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Referring to Figure 1 (A), a game apparatus 10 of this embodiment is a hand-held game apparatus (product name: (Game Boy Advance)) manufactured and marketed by the applicant of the present invention, for example, and includes a case 12. On a surface of the case 12, a liquid crystal display (hereinafter referred to as an "LCD") 14 is provided at an approximately center thereof. In this LCD 14, a game space and a game character existing within the game space are displayed, and a message is displayed as required. In addition, on the surface of the case 12, operating buttons 16, 18, 20, 22, 24, 26, and 28 are provided. The operating buttons 16, 18, and 20 are arranged at the left of the LCD 14, and the operating buttons 22 and 24 are arranged at the right of the LCD 14. Furthermore, at an edge surface (ceiling surface) on an upper side (above the LCD) of the case 12, the operating buttons 26 and 28 are arranged.

The operating button 16 is a cross button that functions as a digital joystick, and by operating one of four depressing portions, capable of instructing a moving direction of the game character displayed on the LCD 14, moving a cursor, and so forth. The operating button 18 is a start button constructed of a push button, and used for instructing starting a game, and so forth. The operating button 20 is a select button constructed of the push button, and used for selecting a game mode, and so forth.

The operating button 22 is an A button constructed of the push button, and capable of allowing the game character displayed on the LCD 14 to perform arbitrary actions such

as strike, throw, capture, ride, jump, and so forth. The operating button 24 is a B button constructed of the push button, and used for changing the game mode selected by a select button 20, canceling the action determined by the A button, and so forth. The operating button 26 is a left-depressing button (L button) constructed of the push button, and the 5 operating button 28 is a right-depressing button (R button) constructed of the push button. The operating button 26 and the operating button 28 are capable of performing a similar operation to the A button 22 and the B button 24, and performing a supporting operation of the A button 22 and the B button 24.

Furthermore, at an upper portion of a rear surface of the case 12, an inserting slot 10 30 is formed. Into this inserting slot 30, a game cartridge 32 is inserted. Although not illustrated, at either portion, that is, a far portion of the inserting slot 30, or an edge portion of an inserting direction of the game cartridge 32, connectors are provided, and therefore, as Figure 1 (B) shows, when the game cartridge 32 is inserted into the inserting slot 30, the two connectors are connected with each other. Thus, a CPU 40 (see Figure 2) 15 of the game apparatus 10 is rendered accessible to the game cartridge 32. In addition, in this game cartridge 32, an ultraviolet ray sensor 32a for detecting an ultraviolet ray included in sunlight (natural light) is provided.

Furthermore, on the surface of the case 12 and below the A button 22 and the button 24, a speaker 34 for outputting a BGM, a sound effect, or a sound (or voices) or a 20 mimicking sound (or voices) of the game character during the game is provided.

Although not illustrated in Figure 1 (A) and Figure 1 (B), on a ceiling surface side of the case 12, an external extension connector 52 (see Figure 2) described later is further provided, and on a rear surface side of the case 12, a battery containing box is provided. In addition, on a bottom surface side of the case 12, a power switch, a sound volume 25 switch, an earphone jack, and etc., are provided.

Electric structure of the game apparatus 10 is shown as in Figure 2. Referring to this Figure 2, in the game apparatus 10, the CPU 40 is provided as described above. This CPU 40 is also called as a computer or a processor, and etc., and responsible for entirely controlling the game apparatus 10. The CPU 40 is connected to a work memory 42, the LCD 14, a key matrix 44, an exchanging buffer 46, the connector 48, and a D/A converter 50 via an internal bus (hereinafter briefly referred to as a "bus").

The work memory 42 is used as a work area or a buffer area of the CPU 40. To the key matrix 44, the cross button 16, the start button 18, the select button 20, the A button 22, the B button 24, the L button 26, the R button 28, and etc., shown in Figure 1 (A) and 10 Figure 1 (B) are connected, and when these buttons are operated, the key matrix 44 generates an operating signal corresponding to the operated button, and inputs the operating signal into the CPU 40.

In the LCD 14, a display signal is applied from the CPU 40, and a game image is displayed. Although not illustrated, a VRAM and an LCD controller are connected to the 15 CPU 40, for example, and under the instruction of the CPU 40, game image (image in the game space) data, character image data, or message display image data read out from a ROM 60 described later are rendered in the VRAM. In addition, the LCD controller reads out image data rendered in the VRAM according to an instruction of the CPU 40, and displays the game space, the character, the message, and etc., in the LCD 14.

20 The exchanging buffer 46 is a buffer for temporarily accumulating data exchanged between another game apparatus in a case of interactively playing a multi-person game, and connected to another game apparatus via the connector 52 and a communication cable (not shown) as the external extension connector, for example.

25 The D/A converter 50 converts into an analog sound (voices) signal data of the sound (sound data) necessary for the game such as the BGM, the sound effect, or the

sound (or voices) or the mimicking sound (or voices) of the game character applied by the CPU 40, and outputs the signal via the speaker 34.

In addition, in the game cartridge 32, a GPIO (General Purpose Input/Output)-equipped ROM (hereinafter briefly referred to as a “ROM”) 60, and an RAM 62 such as a non-volatile memory are provided, the ROM 60 and the RAM 62 are connected with each other via a bus, and connected to the connector 64. As described above, when the game cartridge 32 is attached to the game apparatus 10, the connector 48 and the connector 64 are connected, and therefore, the CPU 40 is electrically connected to the ROM 60 and the RAM 62. Furthermore, to the ROM 60, an ultraviolet ray sensor 32a and a clock IC 66 are provided, and a battery 68 is connected to the clock IC 66.

It is noted that in this embodiment, as the non-volatile memory, a flash memory, a ferroelectric memory (FeRAM), an EEPROM, and etc., can be used, for example.

The ROM 60 is provided with the predetermined number of general-purpose ports, and in response to a request from the CPU 40, applies to the CPU 40 data of an ultraviolet ray value detected in the ultraviolet ray sensor 32a and data of a time period (and month/date) measured by the clock IC 66.

In addition, in the ROM 60, as Figure 3 shows, a game program 602, image data (game image data, character image data, message display image data, and etc.,) 604, ultraviolet ray value correcting data 606, and sound data 608 are accommodated (stored) in advance. Furthermore, the ultraviolet ray value correcting data 606 is constructed of ultraviolet ray graph data 606a and correcting rate data 606b.

The ultraviolet ray graph data 606a is data of a graph showing a change in one day of a previously measured ultraviolet ray value in a specific location (in this embodiment, Japan (Kyoto)) by each predetermined period. In this embodiment, the change of the ultraviolet ray value in one day in each moth (January, February, …, November,

December) is recorded. The change of the ultraviolet ray value in one day may be a change in time of the ultraviolet ray value measured regarding a specific day (15th day in each month, for example). In addition, it may be possible that the change in time of the ultraviolet ray value regarding one portion of the day or all days in the month is measured,  
5 a maximum value in the same time zone is obtained, an average value in the same time zone is calculated, and so forth. Furthermore, the ultraviolet ray value measured in each time zone (in this embodiment, 0 – 1 o'clock, 1 – 2 o'clock, … , 22 – 23 o'clock, 23 – 24 (midnight) o'clock, ) is an ultraviolet ray value measured in all (one hour) or one portion  
10 (15 minutes, for example) in each time zone so as to obtain the maximum value during that time zone, calculate the average value, and so forth.

Figure 4 is one example of a graph rendered based on the ultraviolet ray graph data 606a. As understood from this Figure 4, in each month, from a sunrise (from a time that it is started to detect the ultraviolet ray) to round noon (approximately 12 o'clock), the ultraviolet ray value is high as a time elapses, the ultraviolet ray value is the highest round noon, and thereafter, until a sunset (until the ultraviolet ray is not detected), the ultraviolet ray value is gradually low. The ultraviolet ray value is 0 (zero) at the sunset. In addition, in June and July, May and August, April and September, March and October, February and November, and January and December, it is understood that the change in the ultraviolet ray value is the same or approximately the same. Therefore, the ultraviolet ray  
15 graph data 606a needs not to be stored in such a manner as to correspond to each moth, and may be stored in such a manner as to correspond to the two months having the same or approximately same change in the ultraviolet ray value.  
20

For the sake of illustration, the graph in May and August, and the graph in January and December are illustrated by the same white-colored bar. However, the ultraviolet ray  
25 value in the graph of May and August is larger, and this applies in this embodiment

hereinafter.

The correcting rate data 606b is table data written in such a manner that a  
correcting rate of a case of correcting the ultraviolet ray value measured (detected) during  
the game to a setting value is corresponded to each predetermined time period (in this  
embodiment, 1 hour), and in this embodiment, the table data of each month is stored.  
5 Herein, the setting value is an ultraviolet ray value set in advance by a programmer or a  
developer of a game (game program 602) using the ultraviolet ray value.

Figure 5 (A) is one example of a graph shown by superimposing a graph of the  
ultraviolet ray value (ultraviolet ray value graph) rendered based on the ultraviolet ray  
graph data 606a of July (the same as June) and a graph of the setting value (setting value  
10 graph). As understood from this Figure 5 (A), the ultraviolet ray is strong in July so that  
the ultraviolet ray value exceeds the setting value in each time period (time zone).  
Furthermore, although not illustrated in Figure 5 (A), the ultraviolet ray is weak in  
January and February (see Figure 4) so that the ultraviolet ray is lower than the setting  
15 value in each time zone. Thus, the ultraviolet ray value changes depending on a period  
during which the game is played, and etc., the detected ultraviolet ray value is corrected in  
such a manner as to be equal to or approximately equal to the setting value. Therefore,  
the correcting rate data 606b of July is shown as in Figure 5 (B). Herein, the value of the  
correcting rate is an estimated value obtained by calculating a ratio of the ultraviolet ray  
20 value in each time zone that the ultraviolet ray value graph and the setting value graph  
show. Such the correcting rate data 606b is stored in such a manner as to correspond to  
each month. Or, the correcting rate data 606b may be stored in such a manner as to  
correspond to each ultraviolet ray graph data 606a.

However, as described above, in a case that the ultraviolet ray graph data 606a is  
25 stored in such a manner as to correspond to the two months, similarly, the correcting rate

data 606b may be stored in such a manner as to correspond to the two months.

As shown in Figure 6, in the RAM 62, a game data backup area 622, a storing area 624 of the detected ultraviolet ray value data, a storing area 626 of the corrected ultraviolet ray value data, a storing area 628 of a maximum value table, storing area 630 5 of difference data, a storing area 632 of time data, and a storing area 634 of an ultraviolet ray graph data determining flag are provided.

The game data backup area 622 is an area for recording game data (backup data), and constructed of a first backup area 622a and a second backup area 622b. In this embodiment, the first backup area 622a stores the game data saved by an instruction of a 10 player, and the second backup area 622b stores the game data automatically saved immediately before prohibiting a game process.

The storing area 624 stores the ultraviolet ray value data detected by the ultraviolet ray sensor 32a. More specifically, data (instantaneous value data) 624a regarding an instantaneous value of the ultraviolet ray, and data (accumulated value data) 624b 15 regarding an accumulated value of the ultraviolet ray are stored. The instantaneous value of the ultraviolet ray is detected in each predetermined time period (hereinafter briefly referred to as a “detecting unit time-period”). In addition, in this embodiment, the accumulated value data of the ultraviolet ray has the estimated value calculated according to Equation 1.

20 [Equation 1]

Accumulated value data =  $\Sigma$  (instantaneous value data X detecting unit time-period)

However, the accumulated value data is data that the instantaneous value data of each detecting unit time-period from the game is started until the present time is added.

25 The storing area 626 stores the ultraviolet ray value data having the ultraviolet ray

value data detected by the ultraviolet ray sensor 32a corrected. That is, corrected instantaneous value data 626a that corrected the instantaneous value data 624a, and corrected accumulated value data 626b calculated based on the corrected instantaneous value data 626a are stored.

5        In the storing area 628, the maximum value table described later (see Figure 16) is stored. In addition, in the storing area 630, difference total data obtained when executing an ultraviolet ray value correcting process (3) described later is stored, and as illustrated, difference total value data of last time (last-time difference total value data) 630a, and the difference total value data of this time (this-time difference total value data) 630b are stored. Furthermore, in the storing area 632, data of a time (time data) obtained when executing an ultraviolet ray value correcting process (3) described later is stored. Still furthermore, in the storing area 634, an ultraviolet ray graph data determining flag determined when executing an ultraviolet ray value correcting process (3) described later is stored. This ultraviolet ray graph data determining flag is constructed of a register, and a 10      the register has a bit corresponding to each month (ultraviolet ray graph data 606a), and a data value of the bit corresponding to the determined ultraviolet ray graph data 606a is rendered “1” (flag is turned on), and the data value of the bit corresponding to the other ultraviolet ray graph data 606a is rendered “0” (zero) (flag is turned off).  
15

20      In the game apparatus 10, for example, it is possible to execute a game using the ultraviolet ray included in sunlight detected by the ultraviolet ray sensor 32a provided in the game cartridge 32. This is suggested in view of an influence on a growth of children who play a video game indoors.

25      However, an intensity of the ultraviolet ray (ultraviolet ray value) differs (changes) depending on a period (date/month, season, and etc.,), a location (area (prefecture, country)), or a time during which the game is played so that if the detected

ultraviolet ray value is directly used for the game, as a result of the change, it is not possible to apply a constant fascinating aspect of the game, thus resulting in a problem that a game balance is collapsed.

In addition, if being excessively enthusiastic about the game, the player is  
5 intensely exposed to the ultraviolet ray, thus resulting in a problem that a skin inflammation occurs as a result of sunburn.

As a consequence, in this embodiment, by correcting the detected ultraviolet ray value, the constant fascinating aspect of the game is applied, and in a case of being exposed to a constant amount of the ultraviolet ray, the game process is prohibited.

10 Briefly described, during a time that the game using the ultraviolet ray value is played, the ultraviolet ray value is detected, and the detected ultraviolet ray value is corrected in such a manner as to be equal to or approximately equal to the setting value. Furthermore, an amount of the ultraviolet ray (accumulated value) exposed during the game play is detected, and in a case of being determined that a first predetermined value of the  
15 ultraviolet ray is exposed, a warning is issued, and furthermore, in a case of being determined that being exposed to the ultraviolet ray of a second predetermined value, which is larger than the first predetermined value, the game process is forcedly prohibited.

More specifically, the CPU 40 shown in Figure 2 executes a game process (game  
20 program 602) shown in Figure 7. As shown in Figure 7, when starting the game process, an initial setting is executed in a step S1. That is, a year/month/day, a time, or a game mode, and etc., set in advance according to an operation of the player are set.

In a succeeding step S3, a game starting process described later is executed (see Figure 8). In a step S5, it is determined whether or not the ultraviolet ray is actually  
25 detected. That is, the CPU 40 outputs to the ROM 60 a transmission request of an input

from the ultraviolet ray sensor 32a, and determines whether or not the ultraviolet ray value data transmitted from the ROM 60 is equal to or larger than a predetermined value. Herein, the predetermined value is a numerical value set in order to prevent an erroneous detection of the ultraviolet ray value, and determined by an experiment, and etc. If “NO” 5 in the step S5, that is, if the ultraviolet ray value data is less than the predetermined value, it is determined that the ultraviolet ray is not actually detected, and the process returns to the same step S5.

On the other hand, if “YES” in the step S5, that is, if the ultraviolet ray value data is equal to or larger than the predetermined value, it is determined that the ultraviolet ray 10 is actually detected, and in a step S7, an ultraviolet ray value informing process described later is executed (see Figure 9). Next, in a step S9, an ultraviolet ray value correcting process described later is executed (see Figure 11, Figure 13, Figure 22 – Figure 24), and in a step S11, based on the corrected ultraviolet ray value, that is, the corrected 15 instantaneous value data 626a and the corrected accumulated value data 626b, a changing process of the character image is executed. In correspondence with the corrected instantaneous value data 626a and the corrected accumulated value data 626b, it is possible to grow (develop) a player character and a non-player character such as a plant, and the image in that case is changed. Thus, the corrected ultraviolet ray value 20 (instantaneous value and accumulated value) are reflected in the game so that it is possible to apply a constant fascinating aspect of the game without being affected by a change of the ultraviolet ray value.

In a succeeding step S13, a usage limiting process described later is executed (see Figure 26, and Figure 27), and in a step S15, it is determined whether or not there is a saving instruction. If “NO” in the step S15, that is, unless there is the saving instruction, 25 the process directly advances to a step S19. On the other hand, if “YES” in the step S15,

that is, if there is the saving instruction, the process writes the present game data into the first backup area 622a in a step S17, and then, advances to the step S19. That is, in the step S17, the game data saved (updated) one after another into the work memory 42 according to a proceeding of the game is recorded (saved) into the first backup area 622a by the CPU 40.

In the step S19, it is determined whether or not the game is ended. That is, it is determined whether or not an instruction of ending the game is applied by the player, or whether or not it is game-over. If “NO” in the step S19, that is, unless the game is ended, the process directly returns to the step S5 so as to continue the game. On the other hand, if “YES” in the step S19, that is, if the game is ended, the process directly ends the game process.

It is noted that although omitted in the game process of this embodiment, in the game process, not only a process of a character image change but also another game process is executed. That is, an image process, in which the player character is moved according to the operation of the player, the non-player character is moved, displaying (updating) the image in the game space, and so forth, a displaying process of a message to be displayed in correspondence with the proceeding of the game, a sound outputting process for outputting a music (BGM) and a sound (sound effect), and etc., necessary for the game, and etc., are also executed.

As shown in Figure 8, when starting the game starting process, the CPU 40 determines whether or not the game is played for the first time (from a start) in a step S21. More specifically, prior to the start of the game, the CPU 40 displays a menu screen in the LCD 14, and determines whether or not the player selects starting the game from the start. If “YES” in the step S21, that is, in a case of playing the game for the first time, the process directly advances to a step S33. On the other hand, if “NO” in the step S21, that

is, in a case of playing a portion of the game that the player last played, it is determined whether or not it is a game process prohibiting state in a step S23. That is, in the usage limiting process in the step S13 shown in Figure 7, it is determined whether or not it is rendered the game process prohibiting state.

If “YES” in the step S23, that is, if it is the game process prohibiting state, the process performs a message display (error display) such as “Now, not possible to start the game. Please wait.”, for example, in a step S25 and then, returns to the step S23. That is, the process waits until the game process prohibiting state is cancelled.

On the other hand, if “NO” in the step S23, that is, unless it is the game process prohibiting process, the process determines whether or not to start the game from a point immediately before a game-process is prohibited or immediately before the game is forcedly ended in a step S27. More specifically, the process determines whether or not the player inputs a reading-out instruction of the game data stored in the second backup area 622b.

If “YES” in the step S27, that is, in a case of starting the game from a point immediately before the game-process is prohibited or immediately before the game is forcedly ended, the process reads out the game data stored in the second backup area 622b in a step S29, and advances to the step S33. On the other hand, if “NO” in the step S27, that is, in a case of starting the game from a point in which the game is saved by the instruction of the player last time, determining that the game is not started from a point immediately before the game-process is prohibited or the game is forcedly ended, the process reads out the game data stored in the first backup area 622a in a step S31, and advances to the step S33. That is, in a case of resuming the game from the portion that the player last played, it is possible to select the game data saved by a player’s intention, or the game data automatically saved immediately before the game is forcedly ended.

In the step S33, the game process according to the game data read out in the step S29 or the step S31 or the game process from the start is started based on the game program 602, and the game starting process is returned.

As shown in Figure 9, when starting the ultraviolet ray value informing process,  
5 the CPU 40 writes the detected ultraviolet ray value into the RAM 62 in a step S41. That is, the CPU 40 outputs to the ROM 60 a transmission request of an input of the ultraviolet ray sensor 32a, and writes (stores) into the storing area 624 each of the instantaneous value data 624a of the ultraviolet ray value obtained from the ROM 60 and the accumulated value data 624b calculated according to Equation 1.

10 Although omitted in Figure 7, if “YES” is determined in the step S5, the data of the time measured by the clock IC 66 is stored, and a detecting time-period is evaluated from a difference from the present time. It is noted that the detecting time of the ultraviolet ray value may be measured by providing an additional timer.

15 In a succeeding step S43, the ultraviolet ray value written in the RAM 62 is displayed. That is, the CPU 40 refers to the instantaneous value data 624a and the accumulated value data 624b stored in the RAM 62, and displays (visually displays) the instantaneous value and the accumulated value by the numerical value or a bar graph in one portion or the entire game screen displayed in the LCD 14. However, such as an antenna display showing an intensity of radio wave of a portable phone receiver, a display  
20 (color, luminosity) or the number of specific characters (mark of the Sun, for example) may be changed.

25 Then, in a step S45, it is determined whether or not there is a specific button input (informing instruction by the sound). That is, the CPU 40 determines whether or not a specific operating signal is input from the key matrix 44. If “NO” in the step S45, that is, unless the specific operating signal is input from the key matrix 44, the process

determines that there is no informing instruction by the sound, and directly returns the ultraviolet ray value informing process.

On the other hand, if "YES" in the step S45, that is, if the specific operating signal is input from the key matrix 44, determining that there is the informing instruction by the sound, the process changes the sound in correspondence with a largeness of the ultraviolet ray value written in the RAM 62 in a step S47, and outputs the sound. Then, the process returns the ultraviolet ray value informing process. That is, the CPU 40 changes a kind (single sound  $\Leftrightarrow$  chord or chord  $\Leftrightarrow$  another chord) of the sound (BGM, sound effect, voices or mimicking sound of the game character) output from the speaker 34, changes the intensity (volume of the sound), changes a tone (high or low of a frequency), changes a tempo (strength of a pitch), changes a melody, and so forth. It is noted that the sound may be changed as a result of a combination of two or more of these.

Next, a description will be made regarding the ultraviolet ray value correcting process (S9) shown in Figure 7. It is noted that this process differs depending on a case that the month and the time are known (ultraviolet ray value correcting process (1)), a case that only the time is known (ultraviolet ray value correcting process (2)), and a case that the month and the time are not known (ultraviolet ray value correcting process (3)) so that these cases will be described one by one.

It is noted that the month (and day) and the time, as described above, are items arbitrarily set before the player starts the game process.

In the ultraviolet ray value correcting process (1), the month and the time are known so that as shown in Figure 10 (A), it is possible to correct the detected ultraviolet ray value by the correcting rate data 606b corresponding to the month. Therefore, in such the case, the ultraviolet ray graph data 606a needs not to be stored into the ROM 60.

However, as understood from Figure 10 (B), in a case of not being possible to

exactly detect the ultraviolet ray value depending on weather and an operating situation of the player (direction of a position of the game apparatus 10 (ultraviolet ray sensor 32a) toward the Sun, and etc., for example), there is a case that the ultraviolet ray value is regionally (at a certain time) low so that it is considered to make a correction in such a  
5 manner that the data of the setting value graph described above is included and stored in the ultraviolet ray value correcting data 606 of the ROM 60, and without using the correcting rate data 606b, for example, rendered equal to or approximately equal to the setting value of the time (time zone) corresponding to the ultraviolet ray value actually detected. In this case, although there will be more operation processes, it is possible to  
10 surely bring the data closer to the setting value.

More specifically, as shown in Figure 11, when starting the ultraviolet ray value correcting process (1), the CPU 40 reads out the corresponding correcting rate data 606b from the ROM 60 based on the set month in a step S51. In a succeeding step S53, based on the ultraviolet ray value (instantaneous value data 624a and the accumulated value  
15 data 624b) written in the RAM 62, and the read correcting rate data 606b in the corresponding time, the corrected ultraviolet ray value (the corrected instantaneous value data 626a and the corrected accumulated value data 626b) is calculated. More specifically, the corrected ultraviolet ray value is calculated according to Equation 2.

[Equation 2]

20                   corrected ultraviolet ray value = detected ultraviolet ray value X correcting rate  
data

It is noted that to the detected ultraviolet ray value, the correcting rate (data) of the time (time zone) the same as the time (time zone) that detected each time is multiplied.

Then, in a step S55, the process writes into the storing area 626 the calculated  
25 corrected ultraviolet ray value, that is, the corrected instantaneous value data 626a and the

corrected accumulated value data 626b, and returns the ultraviolet ray value correcting process (1).

In this ultraviolet ray value correcting process (1), the month/date and time are known so that using the relevant correcting rate data 606b, it is possible to promptly

5 correct the detected ultraviolet ray value.

In the ultraviolet ray value correcting process (2), the time is known. However, the month is not known so that it is not known which month of the correcting rate data 606b is used. Therefore, in the ultraviolet ray value correcting process (2), by comparing the detected ultraviolet ray value with all of the ultraviolet ray graph data 606a (of each 10 month), one most approximate ultraviolet ray graph data 606a is determined. Then, using the correcting rate data 606b corresponding to the determined one ultraviolet ray graph data 606a, the detected ultraviolet ray value is corrected.

By comparing the detected ultraviolet ray value as shown in Figure 12 (A) with all (of each month) the ultraviolet ray graph data 606a as shown in Figure 12 (B), the most 15 approximate one ultraviolet ray graph data 606a is determined, for example. As understood from Figure 12 (C) displayed by superimposing the graph shown in Figure 12 (A) and the graph shown in Figure 12 (B), the detected ultraviolet ray value shown in Figure 12 (A) is the most approximate to the change in time of the ultraviolet ray value in April (the same as September). However, in reality, an absolute value of a difference 20 between the detected ultraviolet ray value and the ultraviolet ray value indicated by each ultraviolet ray graph data 606a in the same time (time zone) is detected, and one ultraviolet ray graph data 606a having the smallest difference is determined. Furthermore, using the correcting rate data 606b corresponding to the month (April and 25 September) of the ultraviolet ray graph data 606a, the detected ultraviolet ray value is corrected.

However, as described above, in a case of storing the setting value, the ultraviolet ray value may be corrected in such a manner as to be equal to or approximately equal to the setting values so that the ultraviolet ray graph data 606a and the corresponding correcting rate data 606b need not to be specified.

5 More specifically, the CPU 40 executes the ultraviolet ray value correcting process (2) according to a flowchart shown in Figure 13, and the same process as the ultraviolet ray value correcting process (1) will be only briefly described. As shown in Figure 13, when starting the ultraviolet ray value correcting process (2), the CPU 40 reads out the ultraviolet ray graph data 606a of each month from the ROM 60 in a step S61. In  
10 a succeeding step S63, the ultraviolet ray value data written in the RAM 62 and the ultraviolet ray graph data 606a of each month in the corresponding time are compared. In addition, in a step S65, the month is determined based on a comparing result in the step S63. That is, the month that has the highest degree of approximation, and corresponds to the ultraviolet ray graph data 606a is determined. As described above, the absolute value  
15 of the difference between the detected ultraviolet ray value data and the ultraviolet ray graph data of each month in the same time (time zone) is evaluated, and the month regarding the ultraviolet ray graph data 606a having the smallest difference is determined.

In a succeeding step S67, the correcting rate data 606b corresponding to the determined month is read out, and in a step S69, in the corresponding time, the corrected  
20 ultraviolet ray value (corrected instantaneous value data 626a and the corrected accumulated value data 626b) is calculated according to Equation 2 from the ultraviolet ray value written in the RAM 62 and the read correcting rate data. Furthermore, the calculated corrected ultraviolet ray value is written into the storing area 626, and the ultraviolet ray value correcting process (2) is returned.

25 In this ultraviolet ray value correcting process (2), only the time is known so that

by comparing the detected ultraviolet ray value with the ultraviolet ray graph data 606a in the corresponding time, it is possible to relatively easily determine the correcting rate data 606b used for correcting the detected ultraviolet ray value.

It is noted that in the ultraviolet ray value correcting process (2), the month is  
5 determined in the step S65, and however, if the ultraviolet ray graph data 606a and the  
correcting rate data 606b are corresponded with each other and stored, without  
determining the month, the ultraviolet ray graph data 606a is determined, and the  
corresponding correcting rate data 606b is used, thus possible to calculate the corrected  
ultraviolet ray value.

10 Then, in the ultraviolet ray value correcting process (3), both the month and the  
time are not known (unknown) so that based on the detected ultraviolet ray value and the  
ultraviolet ray graph data 606a, it is not possible to easily determine the correcting rate  
data 606b. Therefore, after describing a basic concept regarding the ultraviolet ray value  
correcting process (3), the actual ultraviolet ray value correcting process (3) will be  
15 described below.

As described above, both the month and the time are unknown, thus a relative  
time-period table (relative time-period table) as shown in Figure 14 is prepared. This  
relative time-period table is an example that a time period of one day (24 hours) is divided  
into 12 portions (from A o'clock to L o'clock in alphabetical order), and one week is 10  
days (in order of the day of the week I to the day of the week X). In this relative  
time-period table, in an actual time period, similar to the order that 2 o'clock comes after  
20 1 o'clock, 3 o'clock comes after 2 o'clock, ..., 1 o'clock comes after 24 o'clock (12  
midnight), it is assumed that B o'clock comes after A o'clock, C o'clock comes after B  
o'clock, ..., A o'clock comes after L o'clock. Regarding the day of the week, similar to  
25 the order that Monday comes after Sunday, Tuesday comes after Monday, ..., Monday

comes after Sunday, it is assumed that the day of the week II comes after the day of the week I, the day of the week III comes after the day of the week II, ..., the day of the week I comes after the day of the week X.

As shown in Figure 15, a maximum value of the ultraviolet ray value  
5 (instantaneous value of the ultraviolet ray value) detected in each time period (zone) of each day of the week is registered in a relevant location of the relative time-period table (hereinafter referred to as a "maximum value table"). Or, an average value of the ultraviolet ray value detected in each time period (zone) may be registered in the relevant location of the relative time-period table. However, a blank column indicates that the  
10 ultraviolet ray value is 0 (zero). In an example of the maximum value table shown in this Figure 15, numerical values of the detected ultraviolet ray value detected during the day of the week I in the first week and the day of the week III in the second week are input in a relevant column of the relative time-period. In addition, a day, which is today, is the day of the week IV in the second week, and illustrated by rendering column completely  
15 black in Figure 15.

In this embodiment, in each week (corresponds to 10 days), the maximum value table is updated. Therefore, in the maximum value table in Figure 15, today is the day of the week IV in the second week so that the ultraviolet ray values from the day of the week I to the day of the week IV in the first week indicated by adding a diagonal line in figure  
20 15 are to be deleted (discarded). That is, as shown in Figure 16 (A), regarding the maximum value table, the columns for the day of the week I to the day of the week X are prepared, a writing of the detected ultraviolet ray value is started from the day of the week I, and the detected ultraviolet ray value detected according to the day (day of the week) and the time period is written one after another. In addition, upon completion of writing  
25 until the day of the week X, the process returns to the next day of the week I, and the

ultraviolet ray value is overwritten. Thus, the maximum value table is updated.

Thus, using the maximum value of each time period (zone) of this maximum value table, the correcting rate data of the ultraviolet ray value is evaluated. To be briefly described, from the ultraviolet ray value in a 10-day period including today, the  
5 maximum value in each time period (A o'clock – L o'clock) is extracted. In an example of the maximum value table shown in Figure 16 (A), at A o'clock, the maximum is 140 on the day of the week III, at B o'clock, the maximum is 100 on the day of the week VI, at C o'clock, the maximum is 20 on the day of the week X, between D o'clock and H o'clock, the value is 0 (zero), at I o'clock, the maximum is 50 on the day of the week V, at J o'clock, the maximum is 110 on the day of the week V, at K o'clock, the maximum is 170 on the day of the week II, and at L o'clock, the maximum is 150 on the day of the week  
10 VI.

It is noted that in a simple method as another embodiment, it is possible to evaluate the correcting rate data based on only the ultraviolet ray value on a certain day (preceding day, for example), and however, due to whether and an operating situation of the player  
15 (direction of the game apparatus 10 (ultraviolet ray sensor 32a), and etc., for example) toward a sunlight), a variance occurs in the detected ultraviolet ray value, and taking into account the day on which the player does not play, in this embodiment, the maximum value in each time zone is extracted as a result of the ultraviolet ray being detected for 10  
20 days.

In addition, in a case of extracting the maximum value once, for executing the ultraviolet ray value correcting process (3) using the maximum value, as shown in Figure 16 (B), the table in which besides the day of the week, the extracted maximum value and the second largest ultraviolet ray value are written may be stored. Herein, the reason why  
25 the second largest ultraviolet ray value is stored is that as described above, even if the

maximum value is deleted in a case of deleting the ultraviolet ray value of 10 or more days before from the maximum value table, the ultraviolet ray value correcting process (3) is surely executed.

Next, a description will be made regarding how to specify the ultraviolet ray graph data 606a for determining the correcting rate data 606b. A graph based on the maximum value table shown in Figure 16 (A) is shown in Figure 17 (A). On the other hand, a graph based on the ultraviolet ray graph data obtained as a result of being previously measured is shown in Figure 17 (B). It is noted that herein, for the sake of simplicity, a graph based on the ultraviolet ray graph data during a period that the ultraviolet ray value is strong, a graph based on the ultraviolet ray graph data during a period that the ultraviolet ray value is relatively strong, and a graph based on the ultraviolet ray graph data during a period that the ultraviolet ray value is weak are shown. In addition, the ultraviolet ray values of each graph shown in Figure 17 (B) are shown in Table 1. It is noted that a time (time zone) during which the ultraviolet ray value is rendered 0 (zero) in all the graphs are omitted.

[Table 1]

ACTUAL TIME PERIOD ULTRAVIOLET RAY VALUE	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20
STRONG PERIOD	10	100	180	230	250	200	150	25
RELATIVELY STRONG PERIOD	0	60	110	180	200	130	80	10
WEAK PERIOD	0	30	60	110	130	80	40	0

As understood from Figure 17 (A) and Figure 17 (B), in the graph based on the maximum value table, there occurs a deviance in time between the graph based on the ultraviolet ray graph data so that it is not possible to specify one ultraviolet ray graph data

606a by a simple comparison. As a consequence, a specified relative time-period in the maximum value table (A o'clock, for example) is set to each of the actual time-periods one by one (0-2 o'clock, 2-4 o'clock, ⋯, 20-22 o'clock, 22-24 o'clock ), that is, by shifting the detected ultraviolet ray value, a difference total of the ultraviolet ray values in each case is calculated. Then, the ultraviolet ray graph data 606a having the difference total rendered a minimum is specified (determined), and in addition, the actual time-period at that time is obtained (recorded).

Its method, and etc., will be described below, and for the sake of simplicity, only a case that the graph (hereinafter referred to as a "graph A") based on the maximum value table and the graph (hereinafter referred to as a "graph B") based on the ultraviolet ray graph data during a period that the ultraviolet ray value is weak are compared so as to calculate the difference total, and one ultraviolet ray graph data is determined will be described.

Figure 18 (A) is a graph in which the relative time-period A o'clock is set to the actual time-period 0-2 o'clock, and the graph A and the graph B are superimposed and shown. As understood from this Figure 18 (A), the graph A and the graph B have almost no overlapped portion, and therefore, it can be said that the time period deviates. In addition, the difference total between the graph A and the graph B is 1120. Herein, the difference total is a sum of the absolute value of the difference regarding the ultraviolet ray value of the graph A and the graph B of each time period (zone).

That is, the difference of each time period is 140 between 0 – 2 o'clock, 100 between 2 - 4 o'clock, 20 between 4 – 6 o'clock, 30 between 6 – 8 o'clock, 60 between 8 – 10 o'clock, 120 between 10 -12 o'clock, 130 between 12 – 14 o'clock, 80 between 14 -16 o'clock, 10 between 16 – 18 o'clock, 110 between 18 – 20 o'clock, 170 between 20 -22 o'clock, and 150 between 22 -24 o'clock. Therefore, the difference total is 1120.

Hereinafter, the same.

Consequently, a case of sliding the graph A will be simply illustrated in each Figure 18 (B), Figure 19 (A), 19 (B), Figure 20 (A), and 20 (B). However, in reality, as described above, the graph is slid in such a manner that the relative time-period A o'clock is set one by one to each actual time-period.

Figure 18 (B) is a graph in which the relative time-period A o'clock is set to the actual time period 8 - 10 o'clock, and the graph A and the graph B are overlapped, and shown. That is, a state that the graph A is slid by 8 hours from a state of Figure 18 (A) is shown. The difference total in this case is 780.

Figure 19 (A) is a graph in which the relative time-period A o'clock is set to the actual time period 12 -14 o'clock, and the graph A and the graph B are overlapped, and shown. The difference total in this case is 320. Figure 19 (B) is a graph in which the relative time-period A o'clock is set to the actual time period 14 -16 o'clock, and the graph A and the graph B are overlapped and shown. The difference total in this case is 280.

Figure 20 (A) is a graph in which the relative time-period A o'clock is set to the actual time period 16 -18 o'clock, and the graph A and the graph B are overlapped and shown. The difference total in this case is 380. Figure 20 (B) is a graph in which the relative time-period A o'clock is set to the actual time period 22 -24 o'clock, and the graph A and the graph B are overlapped and shown. The difference total in this case is 1020.

Thus, the difference total between the graph B in a case of sliding the graph A is calculated, and the difference total when the graph A and the graph B rendered most approximate, that is, a minimum difference total, and an absolute time-period (actual time-period) in which the relative time-period of the detected ultraviolet ray value is set at

that time are stored. That is, in the above example, as shown in Figure 19 (B), in a case that the relative time-period A o'clock is set to the actual time-period 14 – 16 o'clock the difference total is rendered the minimum so that a value (280) of the difference total, and the actual time-period to which the relative time-period is set at that time are brought into being corresponding to the graph B (ultraviolet ray graph data regarding a period during which the ultraviolet ray is weak), and stored in the RAM 62.

Similarly, the minimum value of the difference total, and the actual time-period to which the relative time-period is set at that time, in a case of comparing with the graph based on the ultraviolet ray graph data during a period that the ultraviolet ray is strong and the ultraviolet ray is relatively strong, is stored into the RAM 62.

Figure 21 (A), (B), and (C) are graphs each of which shows a case that the difference total is rendered the minimum in a case of comparing each of the graph A shown in Figure 17 (A) and the graph based on the ultraviolet ray graph data shown in Figure 17 (B). In either graph, in a case that the relative time-period A o'clock is set to the actual time-period 14 – 16 o'clock, the difference total is rendered the minimum. In addition, as understood from this Figure 21 (A), (B), and (C), it is understood that the graph A in the actual time-period 14 – 16 o'clock is the most approximate to the graph (Figure 21 (B)) based on the ultraviolet ray graph data regarding a period during which the ultraviolet ray is relatively strong. That is, the detected ultraviolet ray value (graph A) is approximate to the ultraviolet ray graph data having the smallest difference total, out of the minimum values of the difference total obtained as a result of comparing with each ultraviolet ray graph data. Therefore, it can be said that the correcting data corresponding to the ultraviolet ray graph data may be used. In addition, it can be said that the relative time-period may be set to the actual time-period, besides the difference total stored in such a manner as to be brought into being corresponded to the ultraviolet ray graph data,

stored in the RAM 62.

However, even in a case that the difference total is rendered the smallest, unless the graph based on the detected ultraviolet ray value (maximum value table) is contained during a period between the sunrise and the sunset of the graph based on the ultraviolet ray graph data of a case that the difference total is rendered the smallest, the ultraviolet ray graph data is not appropriate. That is, this is due to a fact that, in a case that the player moves to a country or a region with a time difference, when the player takes on a journey, for example, the time period between the sunrise and the sunset deviates. In this case, it is necessary that all the ultraviolet ray values recorded in the maximum value table are deleted (rejected), the ultraviolet ray value is once again measured, and the maximum value table is re-created.

Furthermore, in the maximum value table shown in Figure 16 (A), a case that the maximum ultraviolet ray value is continuously detected from the relative time-period I o'clock to C o'clock is shown. However, as a result of the player suspending or ending the game, regarding the time zone during which the maximum value of the ultraviolet ray value is not measured, it is considered that the difference is not taken between the ultraviolet ray graph data. This stems from a fact that if one portion of the ultraviolet ray value lacks, the absolute value of the difference becomes large thus not possible to exactly determine the ultraviolet ray graph data, that is, the correcting rate data.

Moreover, in an example shown in Figure 18 – Figure 21, the relative time-period A o'clock is set to each actual time-period so as to calculate the difference total, and it is understood that when the difference total is rendered the minimum is a case that the relative time-period having the detected ultraviolet ray value (of the maximum value table) the maximum is set to the actual time-period having the ultraviolet ray value the maximum in the ultraviolet ray graph data or the actual time-period adjacent thereto.

Therefore, taking these into consideration, in the ultraviolet ray value correcting process (3) of this embodiment, in order to reduce an operation process, in a case of comparing the ultraviolet ray value of the maximum value table with the ultraviolet ray value of the ultraviolet ray graph data, the graph based on the maximum value table is moved (shifted) in such a manner that the ultraviolet ray value of the maximum value table is contained during a period between the sunrise and the sunset of the ultraviolet ray graph data to be compared, and the relative time-period having the ultraviolet ray value of the maximum value table the maximum is set to the actual time-period having the ultraviolet ray value of the ultraviolet ray graph data the maximum or the actual time-period adjacent thereto.

More specifically, the CPU 40 executes the ultraviolet ray value correcting process (3) according to a flowchart shown in Figure 22 – Figure 24, and the same process as the ultraviolet ray value correcting process (1) will be simply described.

As shown in Figure 22, when starting the ultraviolet ray value correcting process (3), the CPU 40 executes a maximum value table updating process described later (see Figure 25) in a step S81. In a succeeding step S83, it is determined whether or not the ultraviolet ray value detected this time is set as a valid ultraviolet ray value. That is, it is determined whether or not the ultraviolet ray value detected this time is the maximum value of the time zone in the maximum value table.

If “NO” in the step S83, that is, unless the ultraviolet ray value detected this time is set as the valid ultraviolet ray value, it is determined whether or not M days are passed (9 days, for example) since the ultraviolet ray value correcting process last time in a step S85. If “YES” in the step S85, that is, if the M days are passed since the ultraviolet ray value correcting process last time, the process advances to a step S87. On the other hand, if “NO” in the step S85, that is, unless the M days are passed since the ultraviolet ray

value correcting process last time, the process advances to a step S127 shown in Figure 24. Furthermore, if "YES" in the step S83, that is, unless the ultraviolet ray value detected this time is set as the valid ultraviolet ray value, the process advances to the step S87.

5           In the step S87, the ultraviolet ray graph data 606a of each month is read out from the storing area 606 of the ROM 60. Next, in a step S89, it is determined whether or not this is a data comparison for the first time. If "NO" in the step S89, that is, if this is the data comparison after the second time, in a step S91, compared with the ultraviolet ray graph data 606b in a period weaker by one level than the last time, the process advances to  
10         a step S95.

On the other hand, if "YES" in the step S89, that is, if this is the data comparison for the first time, compared with the ultraviolet ray graph data 606b in the strongest period (in this embodiment, June, and July) in a step S93, the process advances to the step S95.

15         In the step S95, out of the valid ultraviolet ray values (ultraviolet ray value extracted from the maximum value table), the time having the highest ultraviolet ray value is set to the time of the highest ultraviolet ray value of the ultraviolet ray graph data 606b, and in a succeeding step S97, the time of each ultraviolet ray value is adjusted in such a manner that all the valid ultraviolet ray values are contained between the sunrise  
20         and the sunset. That is, as a result of the processes of step S95 and the step S97, the relative time-period of the maximum value regarding the ultraviolet ray value extracted from the maximum value table is set to a location of approximately 12 o'clock of the actual time-period.

Subsequently, in a step S99 shown in Figure 23, a result of the adjustment in the  
25         step S97, that is, it is determined whether or not all the valid ultraviolet ray values are

contained between the sunrise and the sunset. If "YES" in the step S99, that is, if all the valid ultraviolet ray values are contained between the sunrise and the sunset, the process records the time of each adjusted ultraviolet ray value in a step S101. That is, the process writes into the storing area 632 the time data of the set time each of which corresponds to  
5 the ultraviolet ray value data recorded in the storing area 624.

In a succeeding step S103, the absolute value of the difference between each of the valid ultraviolet ray values, and the ultraviolet ray value of the ultraviolet ray graph data 606b regarding the time each of which corresponds thereto are calculated, and in a step S105, the process writes into the storing area 630 difference total value data (this-time difference total value data) 630b, and advances to a step S113 shown in Figure 24.  
10

Furthermore, if "NO" in the step S99, that is, unless all the valid ultraviolet ray values are contained between the sunrise and the sunset, in a step S107, it is determined whether or not all the valid ultraviolet ray values are contained in the last comparison. If "YES" in the step S107, that is, if contained in the last comparison, the process directly  
15 advances to a step S117 shown in Figure 24. On the other hand, if "NO" in the step S107, that is, unless contained even in the last comparison, in a step S109, all data in the maximum table stored in the storing area 628 are deleted, and in a step S111, the process registers only the ultraviolet ray value detected this time in the maximum value table, and returns to the step S93 shown in Figure 22.

As shown in Figure 24, in a step S113, it is determined whether or not the difference total value data of last time (last-time difference total value data) 630a is stored within the storing area 630. If "NO" in the step S113, that is, unless the last-time difference total value data 630a is stored, the process returns to the step S91 shown in Figure 22. On the other hand, if "YES" in the step S113, that is, if the last-time difference  
25 total value data 630a is stored, it is determined whether or not the this-time difference

total value data 630b is larger the last-time difference total value data 630a in a step S115.

If “YES” in the step S115, that is, if the this-time difference total value data 630b is larger than the last-time difference total value data 630a, it is determined that the ultraviolet ray graph data 606a compared last time in the step S117 is the most 5 approximate. More specifically, in an ultraviolet ray graph data determining flag stored in the storing area 634, a determining flag regarding the ultraviolet ray graph data 606a compared last time is turned on (the data value of the register is rendered “1”). Next, in a step S119, the process uses the time data recorded last time as the time data within the game, and advances to a step S127. More specifically, the CPU 40 deletes (cancels) the 10 time data other than the time data recorded last time, that is, the time data recorded this time, the time data recorded before last time, and etc., from the storing area 632.

In addition, if “NO” in the step S115, that is, if the this-time difference total value data 630b is smaller than the last-time difference total value data 630a, in a step S121, the ultraviolet ray graph data 606a (compared data) subject to compare determines whether 15 or not the ultraviolet ray data 606a of the weakest period (in this embodiment, December, and January). If “NO” in the step S121, that is, unless the compared data is the ultraviolet ray graph data 606a of the weakest period, the process directly returns to the step S91.

On the other hand, if “YES” in the step S121, that is, the compared data is the ultraviolet ray graph data 606a of the weakest period, in a step S123, it is determined that 20 the ultraviolet ray graph data 606a compared this time, that is, the compared data, is the most approximate, that is, the determining flag regarding the compared data is written into the storing area 634. In a succeeding step S125, the process uses the time data recorded this time as the time data within the game, and advances to a step S127. That is, in the step S125, the time data other than the time data this time such as the time data last 25 time, the time data before last time, and etc., is deleted from the storing area 632.

In the step S127, based on the correcting rate data 606b corresponding to the determined ultraviolet ray graph data, and the used time, that is, the time data stored in the time storing area, the corrected ultraviolet ray value is calculated. That is, the corrected ultraviolet ray value data is calculated according to Equation 2. Furthermore, in the step 5 S129, the process writes into the storing area 626 the calculated corrected ultraviolet ray value, and returns the ultraviolet ray value correcting process (3).

In the ultraviolet ray value correcting process (3), it is possible to appropriately correct the ultraviolet ray value even when the month/date and the time are unknown so that without being affected by a deviation of a clock as a result of the clock function being 10 used, a time difference as a result of a difference in region (longitude), a variance of the ultraviolet ray value as a result of a difference in region (latitude), a yearly variance of the ultraviolet ray value, and etc., it is possible to make an accurate correction.

As shown in Figure 25, when starting the updating process of the maximum value table of the ultraviolet ray value correcting process (3), the CPU 40 determines whether 15 or not the ultraviolet ray value is registered in the maximum value table stored in the storing area 628 in a step S141. If “NO” in the step S141, that is, unless the ultraviolet ray value is registered in the maximum value table, the process directly advances to a step S149.

On the other hand, if “YES” in the step S141, that is, if the ultraviolet ray value is 20 registered in the maximum value table, based on the time obtained from the clock IC 66, the setting time, and the number of setting days of the each ultraviolet ray value registered in the maximum value table are updated in a step S143.

In a succeeding step S145, it is determined whether or not there is the ultraviolet ray value that passes the number of the setting days N (10 days, for example) or more 25 days. If “NO” in the step S145, that is, unless there is the ultraviolet ray value that passes

the number of the setting days N or more days, the process directly advances to a step S149. On the other hand, if “YES” in the step S145, that is, if there is the ultraviolet ray value that passes the number of the setting days N or more days, the ultraviolet ray value that is equal to or more than the number of the setting days N is deleted (erased) from the maximum value table, that is, after rejecting the ultraviolet ray value data of the day of the week that corresponds to today, the process advances to a step S149.

In the step S149, the ultraviolet ray value detected this time is registered in a relevant location (location according to the setting time and the number of the setting days) of the maximum value table, and in a step S151, out of the ultraviolet ray values in the same relative time-period within the maximum value table, the highest value is set as the valid ultraviolet ray value in that time period (relative time-period), and the updating process of the maximum value table is returned.

It is noted that in the above-described ultraviolet ray value correcting processes (1) – (3), it may be possible that each process is set to the game program 602 in advance, and each of them is appropriately used depending on the month/date (period) and the setting situation of the time. In addition, if arranged in such a manner that a setting screen such as a menu screen, and etc., is forcedly displayed before starting the game, and the player is guided to set the month and the time, only the ultraviolet ray correcting process (1) may be set to the game program 602. Or, if arranged in such a manner that the setting screen such as the menu screen, and etc., is forcedly displayed before starting the game, and the player is guided to set the time, only the ultraviolet ray correcting process (2) may be set to the game program 602.

Next, the usage limiting process (S13) shown in Figure 7 will be described, and regarding this process, a case (1) that its use is limited by prohibiting the game process based on the ultraviolet ray value, and a case (2) that its use is limited by forcedly ending

the game process will be separately described.

As shown in Figure 26, when starting the usage limiting process (1), the CPU 40 determines whether or not an accumulated value of the ultraviolet ray is a warning level in a step S161. More specifically, the CPU 40 detects the accumulated value data 624b stored in the storing area 624, and determines whether or not the accumulated value data 624b exceeds a first predetermined value.

It is noted that the first predetermined value is a value experimentally obtained by an experiment, and etc., and although omitted in Figure 3, stored in the ROM 60 in advance.

If “NO” in the step S161, that is, unless the accumulated value of the ultraviolet ray exceeds the warning level, the process directly returns the usage limiting process (1). On the other hand, if “YES” in the step S161, that is, if the accumulated value of the ultraviolet ray exceeds the warning level, in a step S163, a warning display is performed. The CPU 40 displays a message such as “If you continue the game, dangerous!” on the LCD 14, for example.

In a succeeding step S165, it is determined whether or not the accumulated value of the ultraviolet ray is a dangerous level. More specifically, the CPU 40 detects the accumulated value data 624b stored in the storing area 624, and determines whether or not the accumulated value data 624b exceeds a second predetermined value larger than the first predetermined value.

It is noted that similar to the first predetermined value, the second predetermined value is a value experimentally obtained by the experiment, and etc., and although omitted in Figure 3, stored in the ROM 60 in advance.

If “NO” in the step S165, that is, unless the accumulated value of the ultraviolet ray is the dangerous level, the process directly returns the usage limiting process (1). On

the other hand, if “YES” in the step S165, that is, if the accumulated value of the ultraviolet ray is the dangerous level, the process writes into a second backup area 622b the present game data in a step S167. More specifically, the CPU 40 stores in the work memory 42 game data occurring according to a proceeding of the game, and in the step 5 S167, the process writes into the second backup area 622b the latest game data stored in the work memory 42.

In a succeeding step S169, the game process based on the ultraviolet ray value is prohibited, that is, an input from the key matrix 42 is invalidated, the operating signal by the player is rendered unacceptable, and a message that informs of being not possible to 10 use the ultraviolet ray value is displayed in a step S171. The CPU 40 displays on the LCD 14 a message such as “Not possible to play this game for a while” in the step S171.

In a succeeding step S173, it is determined whether or not a predetermined time period is elapsed. Although not illustrated, in the step S169, the time of the clock IC 66 when the game process based on the ultraviolet ray is prohibited is obtained, the 15 difference between the present time is detected, and it is determined whether or not the time period during which the game process is prohibited passes a predetermined time period (30 minutes, for example). However, it may be possible that an additional timer is provided, and the time period during which the game process is prohibited is measured. In addition, a determination is made based on an elapsed time-period from the time that 20 the game process is prohibited, and however, it may be possible that since an excessive exposure to the ultraviolet ray is prevented, after prohibiting the game process, the determination is made based on the elapsed time-period from the time that the ultraviolet ray is no longer detected.

If “NO” in the step S173, that is, unless the predetermined time period is elapsed, 25 the process returns to the step S169. That is, besides maintaining a prohibiting state of the

game process based on the ultraviolet ray, a message that informs of being not possible to use the ultraviolet ray value is continuously displayed. On the other hand, if “YES” in the step S173, that is, if the predetermined time period is elapsed, a game process prohibition based on the ultraviolet ray value is canceled in a step S175, the process displays a message that informs of being possible to use the ultraviolet ray value in a step S177, and thereafter, returns the usage limiting process (1). More specifically, besides validating the input from the key matrix 42, the CPU 40 displays on the LCD 14 a message that informs of being “Possible to play this game”.

It is noted that in the usage limiting process (1) (the same is true of a usage limiting process (2) described later), in a case of determining the warning level or the dangerous level, the accumulated value data 624b is used, and this is for a purpose of warning or the game process based on the accumulated value of the ultraviolet ray value exposed actually. That is, this is due to the fact that if the corrected accumulated value data 626b is used, in August in which the ultraviolet ray is strong, in reality, even if the accumulated value exceeds the warning level or the dangerous level, the warning or the game process is not prohibited, thus resulting in the excessive exposure to the ultraviolet ray, and on the other hand, in January in which the ultraviolet ray is weak, in reality, even if the accumulated value does not reach the warning level or the dangerous level, there occurs a problem that the warning or the game process is prohibited.

Next, referring to Figure 27, a description will be made to the usage limiting process (2), and regarding the same process as the usage limiting process (1), a detailed description will be omitted. As shown in Figure 27, when starting the usage limiting process (2), the CPU 40 determines whether or not the accumulated value of the ultraviolet ray is the warning level in a step S181.

If “NO” in the step S181, that is, unless the accumulated value of the ultraviolet

ray is the warning level, the process directly returns the usage limiting process (2). On the other hand, if “YES” in the step S181, that is, if the accumulated value of the ultraviolet ray is the warning level, in a step S183, the warning display is performed, and in a step S185, it is determined whether or not the accumulated value of the ultraviolet ray is the dangerous level.

If “NO” in the step S185, that is, unless the accumulated value of the ultraviolet ray is the dangerous level, the process directly returns the usage limiting process (2). On the other hand, if “YES” in the step S185, that is, if the accumulated value of the ultraviolet ray is the dangerous level, in a step S187, the process writes into the second backup area 622b the present game data, and executes a forcedly ending process of the game in a step S189. The CPU 40 forcedly displays an initial screen on the LCD 14 in the step S189, for example.

In a succeeding step S191, a game resume prohibiting process is executed. The CPU 40 invalidates the input from the key matrix 42, and does not accept the operating signal by the player, for example. In a succeeding step S193, it is determined whether or not the predetermined time period (30 minutes, for example) is elapsed.

It is noted that in such the case, in the step S189, the time of the clock IC 66 at a time of executing the forcedly ending process of the game is obtained, the difference between the present time is detected, and it is determined whether or not the time period at which the game is forcedly ended passes the predetermined time period (30 minutes, for example). However, it may be possible that an additional timer is provided, and the time at which the game is forcedly ended is measured. In addition, although a determination is made based on the elapsed time-period from a time that the forcedly ending process of the game is executed, the excessive exposure to the ultraviolet ray is prevented so that after executing the forcedly ending process of the game, the

determination may be made based on the elapsed time-period from a time that the ultraviolet ray is not longer detected.

If "NO" in the step S193, that is, unless the predetermined time period is elapsed, the process directly returns to the step S191. That is, the game resume prohibiting state is maintained. On the other hand, if "YES" in the step S193, that is, the predetermined time period is elapsed, the game resume prohibiting process is cancelled in a step S195, that is, the process validates the input from the key matrix 42, and returns the usage limiting process (2).

It is noted that the descriptions are made regarding the usage limiting process (1), and the usage limiting process (2), and either one of the processes may be stored in the game program 602. This is an item determined by a programmer or a developer.

Furthermore, in the usage limiting process (1), and the usage limiting process (2), the description is made that the first predetermined value and the second predetermined values are constant values, and however, depending on the period (month, in this embodiment) determined by the setting of the player or the ultraviolet ray value correcting process, the first predetermined value and the second predetermined value may be changeable. This is due to the fact that between summer, in which the ultraviolet ray is strong, and winter, in which the ultraviolet ray is weak, there is a difference regarding the influence affecting a human body.

According to this embodiment, the detected ultraviolet ray value is corrected, and brought closer to the setting value graph so that irrespective of the period or the location in which the game is played, it is possible to apply a constant fascinating aspect of the game.

In addition, in a case of determining that a predetermined amount of the ultraviolet ray is exposed, the play of the game using the ultraviolet ray is prohibited, thus the player

is obliged to interrupt the game, select another game, and so forth. Therefore, it is possible to effectively prevent the excessive exposure to the ultraviolet ray. In addition, not only the player but also the game apparatus itself are not to be excessively exposed to sunlight so that it is possible to prevent a damage due to a rise in temperature.

5        It is noted that in this embodiment, the ultraviolet ray graph data obtained by previously measuring the ultraviolet ray value of each month in a region in which the four seasons exist such as Japan is stored, one ultraviolet ray graph data is specified from the detected ultraviolet ray values, and the correcting rate data corresponding to the ultraviolet ray graph data is used. However, the ultraviolet ray value varies depending on 10 the period (month/date) or the location or the region (longitude, latitude), and etc., so that if a large number of the ultraviolet ray graph data different depending on the month/date or the region, and etc., are further stored, it is possible to more exactly correct the detected ultraviolet ray value. However, in a case of simply correcting the ultraviolet ray value, it is considered that only the ultraviolet ray graph data depending on the four seasons are 15 stored, and the operation process is reduced in length, for example.

Furthermore, in this embodiment, although the ultraviolet ray sensor is provided in the game cartridge, the ultraviolet ray sensor may be provided in the game apparatus. In this case, when the game cartridge that records a game program of the game using the ultraviolet ray is attached, the input from the ultraviolet ray sensor may be validated.

20      Furthermore, in this embodiment, only the hand-held game apparatus is described. However, if the ultraviolet ray sensor is provided, it is needless to say that it is possible to adapt to a mode such as a hand-held computer, a hand-held information terminal, a portable phone, and etc., provided with the game function.

25      Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to

be taken by way of limitation, the spirit and scope of the present invention being limited only by the terms of the appended claims.